

New photonic structures in biology

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Many living organisms have developed complex photonic structures which work at filtering visible and near-visible light, providing these species with natural competing advantages in their developing environment. The iridescent colors of some insects (butterfly, beetles, weevils, dragonflies...) and the colored reflections from bird feathers are well-known examples of these.

In this communication, we discuss some recent progress in the understanding of the structures, and of the functions of these structures, found on highly evolved organisms. On the basis of investigations recently carried out in Namur [1], we show that (1) photonic structures can have important impact on the thermal stability of living species in rough environment (example of the butterfly *Polyommatus daphnis*), (2) light manipulation by photonic structure can lead to non-iridescent colors (example of the butterfly *Cyanophrys remus*, which shows photonic "polycrystalline" structures), (3) photonic structures can efficiently protect against ultraviolet radiation (example of the "edelweiss", *Leontopodium nivale*, fleece submicron structure).

Issues regarding the numerical simulation of the complex structures showing up in biology will be addressed and the impact of such studies on the design of artificial structures will be discussed.

[1] L.P. Biró *et al.*, Phys. Rev. E **67**, 021907 (2003); J.P. Vigneron *et al.* Phys. Rev. E **71**, 011906 (2005)